Paper Code Number: 4193	2024 (1^{st}-A) INTERMEDIATE PART-II (12^{th} Class)	Roll No:

MATHEMATICS PAPER-II GROUP-I

TIME ALLOWED: 30 Minutes | **OBJECTIVE** | **MAXIMUM MARKS: 20**

Q.No.1 You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that bubble in front of that question number, on bubble sheet. Use marker or pen to fill the bubbles. Cutting or filling two or more bubbles will result in zero mark in that question.

S.#	QUESTIONS	A	B	C	D
1	Length of latus ractum of ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is:	$\frac{2a^2}{b}$	$\frac{a^2}{b}$	$\frac{b^2}{a}$	$\frac{2b^2}{a}$
2	Equation of tangent to circle $x^2+y^2=a^2$ at (x_1, y_1) is:	$xx_1+yy_1=a^2$	$xx_1-yy_1=a^2$	$xy_1+x_1y=a^2$	$xy_1-x_1y=a^2$
3	If α, β, γ are direction cosines of a vector then $\cos^2\alpha+\cos^2\beta+\cos^2\gamma=?$	3	1	2	0
4	For what value of 'α' vectors $5\hat{i}-\hat{j}+\hat{k}$ and $\alpha\hat{i}+3\hat{j}-3\hat{k}$ are parallel to each other:	-3	15	-15	3
5	If any two vectors of scalar triple product are equal then value is:	1	-1	2	0
6	$\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^{2n}=?$	e^{-1}	$e^{\frac{1}{2}}$	e^2	e^3
7	The function $f(x)=\frac{x^2+1}{x-1}$ is discontinuous at:	$x=2$	$x=0$	$x=-1$	$x=1$
8	Derivative of x^0 with respect to 'x' is:	0	x	1	c
9	$\frac{d}{dx}[fog(x)]=?$	$f'[g(x)]$	$f'[g'(x)]$	$f'[g(x)]g'(x)$	$f[g(x)]g'(x)$
10	Geometrically $\frac{dy}{dx}$ means	Tangent of slope	Slope of line	Slope of $x-$axis	Slope of tangent
11	$\lim_{h\to 0}\frac{f(a+h)-f(a)}{h}=?$	$f'(a)$	$f'(x)$	$f'(a+h)$	$f(a)$
12	$\int\frac{f'(x)}{f(x)}dx=?$	$\ln\lvert x\rvert+c$	$\ln\lvert f(x)\rvert+c$	$\ln\lvert f'(x)\rvert+c$	$f(x)$
13	$\int(ax+b)^n dx$ where $n\neq-1$ is:	$\frac{(ax+b)^{n+1}}{n+1}+c$	$\frac{(ax+b)^{n+1}}{a}+c$	$\frac{(ax+b)^{n+1}}{a(n+1)}+c$	$\frac{(ax+b)^{n+1}}{n}+c$
14	$\int 2^x dx=?$	$x2^{x-1}+c$	$2^x\ln 2+c$	$\frac{2^{x+1}}{x+1}+c$	$\frac{2^x}{\ln 2}+c$
15	When expression $\sqrt{a^2-x^2}$ involve in integration, we substitute:	$x=a\sin\theta$	$x=a\sec\theta$	$x=a\tan\theta$	$x=\sin\theta$
16	All points (x,y) with $x<0$, $y<0$ lies in quadrant:	I	II	III	IV
17	Slope of line passing through points $A(x_1, y_1)$ and $B(x_2, y_2)$ is:	$\frac{x_2-x_1}{y_2-y_1}$	$\frac{y_2+y_1}{x_2+x_1}$	$\frac{y_2-x_2}{y_1-x_1}$	$\frac{y_2-y_1}{x_2-x_1}$
18	Equation of vertical line through points $(3,-5)$ is:	$y=-5$	$y=5$	$x=3$	$x=-3$
19	Which of the following ordered pair does not satisfy $4x-3y<2$:	(1, 1)	(3, 0)	(–2, 1)	(0, 0)
20	Radius of circle $x^2+y^2=5$ is:	5	25	$\sqrt{5}$	$\frac{5}{2}$

INTERMEDIATE PART-II (12th Class)	2024 (1st-A)	Roll No: ________
MATHEMATICS PAPER-II GROUP-I		
TIME ALLOWED: 2.30 Hours	SUBJECTIVE	MAXIMUM MARKS: 80

NOTE: Write same question number and its parts number on answer book, as given in the question paper.

SECTION-I

2. Attempt any eight parts. $8\times2=16$

(i)	Discuss continuity of $g(x)=\frac{x^2-9}{x-3}$, $x\neq3$ at $x=3$	(ii)	Determine whether $f(x)=\sin x+\cos x$ is even or odd function.
(iii)	Define Constant Function. Give one example also.	(iv)	Find $f^{-1}(x)$, when $f(x)=\frac{2x+1}{x-1}$ where $x>1$
(v)	Differentiate $\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2$ w.r.t 'x'.	(vi)	Find $\frac{dy}{dx}$, if $y^2+x^2-4x=5$
(vii)	Find derivative of $x^2-\frac{1}{x^2}$ w.r.t. x^4	(viii)	Prove that $\frac{d}{dx}[\cot^{-1}x]=-\frac{1}{1+x^2}$, $x\in R$
(ix)	Determine the values of x for which f defined as $f(x)=x^2+2x-3$ is increasing.	(x)	Define Taylor series expansion of function f at $x=a$
(xi)	Find y_2, if $y=\ln\left(\frac{2x+3}{3x+2}\right)$	(xii)	Find $\frac{dy}{dx}$, if $y=xe^{\sin x}$

3. Attempt any eight parts. $8\times2=16$

(i)	Find dy if $y=x^2+2x$ and x changes from 2 to 1.8.	(ii)	Evaluate $\int\frac{dx}{\sqrt{x}(\sqrt{x}+1)}$
(iii)	Evaluate $\int\cos 3x\ \sin 2x\ dx$	(iv)	Evaluate $\int\sec x\ dx$
(v)	Evaluate $\int x^2\ln x\ dx$	(vi)	Evaluate $\int_0^{\pi/4}\sec x(\sec x+\tan x)\,dx$
(vii)	Solve the differential equation $\frac{dy}{dx}=\frac{y^2+1}{e^{-x}}$	(viii)	Show that the points $A(3,1)$, $B(-2,-3)$ and $C(2,2)$ are vertices of an isosceles triangle.
(ix)	Find slope and inclination of the line joining the points $(3,-2)$ and $(2,7)$.		
(x)	Find an equation of the line through $(-5,-3)$ and $(9,-1)$.		
(xi)	Convert the equation $15y-8x+3=0$ into normal form.		
(xii)	Find the angle from the line with slope $\frac{-7}{3}$ to the line with slope $\frac{5}{2}$.		

4. Attempt any nine parts. $9\times2=18$

(i)	What are Decision Variables?	(ii)	Draw the graph of inequality $2x+3y\leq12$
(iii)	Find the centre and radius of the circle $x^2+y^2-6x+4y+13=0$		
(iv)	Check the position of the point $(5,6)$ with respect to the circle $x^2+y^2=81$		
(v)	Find the focus and directix of the parabola $x^2=4(y-1)$.		
(vi)	Write an equation of the ellipse with centre (0, 0) focus $(0,-3)$, vertex (0, 4).		
(vii)	Find foci and eccentricity of $x^2-y^2=9$		
(viii)	Find the length of the tangent drawn from the point $P(-5,10)$ to the circle $5x^2+5y^2+14x+12y-10=0$		
(ix)	Write the direction cosines of $\underline{v}=2\underline{i}+3\underline{j}+4\underline{k}$.		
(x)	Find a vector whose magnitude is 4 and parallel to $2\underline{i}-3\underline{j}+6\underline{k}$		
(xi)	Find $\underline{b}\times\underline{a}$ where $\underline{a}=3\underline{i}-2\underline{j}+\underline{k}$, $\underline{b}=\underline{i}+\underline{j}$		
(xii)	Find the value of $3\underline{i}\cdot\underline{k}\times\underline{i}$	(xiii)	If $\underline{a}+\underline{b}+\underline{c}=0$, then prove that $\underline{a}\times\underline{b}=\underline{b}\times\underline{c}$

SECTION-II

NOTE: Attempt any three questions. $3\times10=30$

5.(a)	Show that $\lim_{x\to0}\frac{a^x-1}{x}=\log_e a$	(b)	If $x=a\cos^3\theta$, $y=b\sin^3\theta$, show that: $a\frac{dy}{dx}+b\tan\theta=0$
6.(a)	If $y=(\cos^{-1}x)^2$, prove that $(1-x^2)y_2-xy_1-2=0$	(b)	Show that $\int\sqrt{a^2-x^2}\,dx=\frac{a^2}{2}\sin^{-1}\frac{x}{a}+\frac{x}{2}\sqrt{a^2-x^2}+c$
7.(a)	Evaluate $\int_0^{\sqrt{3}}\frac{x^3+9x+1}{x^2+9}dx$	(b)	Maximize $f(x,y)=2x+5y$ subject to the constraints $2y-x\leq8$, $x-y\leq4$, $x\geq0$, $y\geq0$
8.(a)	Write an equation of the circle that passes through $A(-7,7)$, $B(5,-1)$, $C(10,0)$		
(b)	Prove that in any triangle ABC $a=b\cos C+c\cos B$		
9.(a)	Find the focus, vertex and directix of the parabola $x^2-4x-8y+4=0$		
(b)	The midpoints of the sides of a triangle are $(1,-1)$, $(-4,-3)$ and $(-1,1)$. Find coordinates of the vertices of the triangle.		

Paper Code Number: 4196	2024 (1st-A) INTERMEDIATE PART-II (12th Class)	Roll No: Multan Board-2024
MATHEMATICS PAPER-II GROUP-II		
TIME ALLOWED: 30 Minutes	OBJECTIVE	MAXIMUM MARKS: 20

Q.No.1 You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that bubble in front of that question number, on bubble sheet. Use marker or pen to fill the bubbles. Cutting or filling two or more bubbles will result in zero mark in that question.

S.#	QUESTIONS	A	B	C	D
1	The equation of directix of the parabola $x^2=-16y$ is:	$y+4=0$	$y-4=0$	$x+4=0$	$x-4=0$
2	The eccentricity of $\frac{y^2}{4}-x^2=1$ is:	$\frac{\sqrt{5}}{2}$	$\frac{2}{\sqrt{5}}$	$\frac{-2}{\sqrt{5}}$	2
3	$3\hat{i}\cdot(2\hat{j}\times\hat{k})=?$	0	2	3	6
4	$Cos\,\theta$ equal to:	$\hat{a}\times\hat{b}$	$\hat{a}\cdot\hat{b}$	$\lvert\hat{a}\times\hat{b}\rvert$	$\underline{a}\times\underline{b}$
5	The length of the vector $2\hat{i}-2\hat{j}-\hat{k}$ is:	3	4	5	2
6	The function $x^2+xy+y^2=2$ of x and y is:	Constant	Even	Implicit	Explicit
7	If $f(x)=2x-8$, then $f^{-1}(x)=?$	$8-2x$	$8+2x$	$\frac{x-8}{2}$	$\frac{x+8}{2}$
8	$\frac{d}{dx}(3^x)=?$	$\frac{3^x}{\ell n3}$	$x\,\ell n3$	$3^x\,\ell n3$	$3^x\,\ell nx$
9	If $y=\cos^{-1}\frac{x}{a}$, then $\frac{dy}{dx}=?$	$\frac{-1}{\sqrt{a^2-x^2}}$	$\frac{-a}{\sqrt{x^2+a^2}}$	$\frac{a}{\sqrt{x^2-a^2}}$	$\frac{a}{\sqrt{a^2-x^2}}$
10	$\frac{d}{dx}(\cos x)=?$	$\sin x$	$-\sec x$	$\sec x$	$-\sin x$
11	If $y=\cos^{-1}\frac{x}{a}$, then $\cos y=?$	x	$\frac{x}{a}$	$\frac{y}{a}$	$\sin y$
12	$\int_0^{\pi}\sin x\,dx=?$	$\cos\pi$	0	1	2
13	$\int\tan x\,dx=?$	$\ln\lvert\sec x\rvert+c$	$\ln\lvert\operatorname{cosec} x\rvert+c$	$\ln\lvert\sin x\rvert+c$	$\ln\lvert\cot x\rvert+c$
14	$\int\frac{e^x}{e^x+5}dx=?$	$(e^x+5)+c$	$\ln(e^x+5)+c$	$e^{2x}+5$	$e^{2x}+7+c$
15	$\int-\operatorname{cosec}^2 x\,dx=?$	$\cos x+c$	$\tan x+c$	$\operatorname{cosec} x+c$	$\cot x+c$
16	If α is the inclination of line ℓ, then $\frac{x-x_1}{\cos\alpha}=\frac{y-y_1}{\sin\alpha}=r\,(say)$ is called:	Point-slope form	Normal form	Symmetric form	Two-points form
17	Equation of line bisecting first and third quadrant is:	$x=0$	$y=0$	$y=-x$	$y=x$
18	The perpendicular distance of line $3x+4y-15=0$ from the origin is:	3	2	1	0
19	The graph of $2x\geq 4$ lies in:	Upper Half Plane	Lower Half Plane	Left Half Plane	Right Half Plane
20	Radius of circle $x^2+y^2=5$ is:	5	-5	$\sqrt{5}$	25

INTERMEDIATE PART-II (12th Class)	2024 (1st-A)	Roll No:
MATHEMATICS PAPER-II GROUP-II		
TIME ALLOWED: 2.30 Hours	SUBJECTIVE	MAXIMUM MARKS: 80

NOTE: Write same question number and its parts number on answer book, as given in the question paper.

SECTION-I

2. Attempt any eight parts. $8 \times 2 = 16$

(i) Define Implicit Function.

(ii) Without finding the inverse, state the domain and range of f^{-1} $f(x)=\sqrt{x+2}$

(iii) Prove that $\lim_{x\to 0}(1+x)^{\frac{1}{x}} = e$

(iv) Evaluate $\lim_{x\to 0}\frac{\sin x^0}{x}$

(v) Find by definition, derivative of $2x^2+1$ with respect to x

(vi) Differentiate with respect to 'x' $\frac{x^2+1}{x^2-3}$

(vii) Find $\frac{dy}{dx}$ if $y^2-xy-x^2+4=0$

(viii) Find $\frac{dy}{dx}$ if $x=y\sin y$

(ix) Find $f'(x)$ if $f(x)=x^3e^{\frac{1}{x}},\ x\neq 0$

(x) Find y_2 if $y=\ln\left(\frac{2x+3}{3x+2}\right)$

(xi) By Maclaurin's series, show that $\cos x = 1-\frac{x^2}{2!}+\frac{x^4}{4!}-\frac{x^6}{6!}+$ ______

(xii) Determine in which interval 'f' is increasing or decreasing for domain mentioned $f(x)=4-x^2,\quad x\in(-2,2)$

3. Attempt any eight parts. $8 \times 2 = 16$

(i) Find δy and dy in $y=x^2-1$ where x changes from 3 to 3.02.

(ii) Evaluate the integral $\int\frac{1}{x^2+4x+13}dx$

(iii) Evaluate the integral $\int x\ln x\,dx$

(iv) Evaluate $\int_{-2}^{0}\frac{1}{(2x-1)^2}dx$

(v) Find the area bounded by the curve $y=x^3+3x^2$ and the $x-$axis.

(vi) Solve the differential equation $\sin y\ \operatorname{cosec} x\ \frac{dy}{dx}=1$

(vii) Find the general solution of the equation $\frac{dy}{dx}-x=xy^2$

(viii) Show that the points $A(3,1)$, $B(-2,-3)$ and $C(2,2)$ are vertices of an isosceles triangle.

(ix) The $xy-$coordinate axes are rotated about the origin through the indicated angle and the new axes are OX and OY. Find the $xy-$coordinates of P with the given $XY-$coordinates $P(-5,3);\ \theta=30°$

(x) Write down an equation of the straight line passing through (5, 1) and parallel to a line passing through the points $(0,-1)$, $(7,-15)$

(xi) Find the point of intersection of the lines $5x+7y=35,\ 3x-7y=21$

(xii) Find an equation of the line with $x-$intercept -3 and $y-$intercept 4.

4. Attempt any nine parts. $9 \times 2 = 18$

(i) Define Feasible Solution.

(ii) Graph the inequality $x+2y<6$

(iii) Find the equation of the circle with centre at $(\sqrt{2},-3\sqrt{3})$ and radius $2\sqrt{2}$.

(iv) Find focus and directix of the parabola $y^2=-8(x-3)$

(v) Find length of tangent from the point $(-5,10)$ to the circle $5x^2+5y^2+14x+12y-10=0$

(vi) Find the centre and the foci of ellipse $9x^2+y^2=18$

(vii) Write equation of hyperbola with foci $(\pm5,0)$ and vertex (3, 0).

(viii) Define Conic Section.

(ix) Find the vector from the point A to the origin where $\overrightarrow{AB}=4\underline{i}-2\underline{j}$ and B is the point $(-2,5)$.

(x) If $\left|\alpha\underline{i}+(\alpha+1)\underline{j}+2\underline{k}\right|=3$. Find the value of α.

(xi) Show that the vectors $3\underline{i}-2\underline{j}+\underline{k}$, $\underline{i}-3\underline{j}+5\underline{k}$ and $2\underline{i}+\underline{j}-4\underline{k}$ form a right angle.

(xii) If $\underline{a}+\underline{b}+\underline{c}=0$, then prove that $\underline{a}\times\underline{b}=\underline{b}\times\underline{c}$

(xiii) A force $\underline{F}=2\underline{i}+\underline{j}-3\underline{k}$ acting at a point $A(1,-2,1)$. Find the moment of $\underline{F}$ about the point $B(2,0,-2)$

SECTION-II

NOTE: Attempt any three questions. $3 \times 10 = 30$

5.(a) If $f(x)=\begin{cases}\frac{\sqrt{2x+5}-\sqrt{x+7}}{x-2}, & x\neq 2\\ k, & x=2\end{cases}$

Find value of 'k' so that 'f' is continuous at $x=3$.

(b) Show that $\frac{dy}{dx}=\frac{y}{x}$ if $\frac{y}{x}=\tan^{-1}\frac{x}{y}$

6.(a) If $y=e^x\sin x$, show that $\frac{d^2y}{dx^2}-2\frac{dy}{dx}+2y=0$

(b) Evaluate $\int\sqrt{3-4x^2}\,dx$

7.(a) Evaluate $\int_{0}^{\sqrt{3}}\frac{x^3+9x+1}{x^2+9}dx$

(b) Graph the feasible region of the following system of linear inequalities and find the corner points. $2x+3y\le 18,\ \ 2x+y\le 10,\ \ x+4y\le 12,\ \ x\ge 0,\ \ y\ge 0$

8.(a) Find volume of the tetrahedron with vertices $A(2,1,8)$, $B(3,2,9)$, $C(2,1,4)$ and $D(3,3,10)$

(b) Write equations of two tangents from (2, 3) to the circle $x^2+y^2=9$

9.(a) Show that the equation $9x^2-18x+4y^2+8y-23=0$ represents an ellipse. Find its elements.

(b) Find an equation of medians of the triangle whose vertices are $A(-3,2)$, $B(5,4)$ and $C(3,-8)$

16-2024(1st-A)-12000 (MULTAN)

Paper Code Number: 4195	2023 (1st-A) INTERMEDIATE PART-II (12th Class)	Roll No: ________

MATHEMATICS PAPER-II GROUP-I

TIME ALLOWED: 30 Minutes	OBJECTIVE	MAXIMUM MARKS: 20

Q.No.1 You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that bubble in front of that question number, on bubble sheet. Use marker or pen to fill the bubbles. Cutting or filling two or more bubbles will result in zero mark in that question.

S.#	QUESTIONS	A	B	C	D
1	Slope of line perpendicular to the line $x + 2y + 3 = 0$ is:	$-\frac{1}{2}$	$\frac{1}{2}$	2	$\frac{3}{2}$
2	Distance of the point $(3, 2)$ from $x-$axis is:	2	3	5	6
3	The lines ℓ_1, ℓ_2 with slopes m_1 and m_2 are parallel if:	$m_1 + m_2 = 0$	$m_1 m_2 = 1$	$m_1 m_2 = -1$	$m_1 = m_2$
4	$x = 5$ is the solution of inequality:	$2x + 3 < 0$	$2x - 3 > 0$	$x + 1 < 0$	$x < 0$
5	The centre of the circle $(x+1)^2 + (y+2)^2 = 16$ is:	$(1, 2)$	$(-1, 2)$	$(-1, -2)$	$(1, -2)$
6	An angle in semi-circle is of measure:	30^o	45^o	60^o	90^o
7	The parabola $y^2 = 4ax;\ a > 0$ opens towards:	Left	Right	Upward	Downward
8	In an ellipse, the foci lie on:	Major axis	Minor axis	Directrices	Centre
9	Work done by a constant force $\vec{F}$ during displacement $\vec{d}$ is equal to	$\vec{F} \times \vec{d}$	$\vec{F}\vec{d}$	$\vec{F} . \vec{d}$	$\vec{d} \times \vec{F}$
10	If $\vec{a}$ and $\vec{b}$ are two non-zero vectors, then $\vec{a} \times \vec{b} =$	ab	$\vec{a} . \vec{b}$	$\vec{b} \times \vec{a}$	$-\vec{b} \times \vec{a}$
11	$\lim_{x \to +\infty} (e$[illegible]$) =$	[illegible]	0	1	$+\infty$
12	$f(x) =$ [illegible] is a/an:	Odd function	Even function	Neither even nor odd	Constant function
13	If $C \in D_f$ and $f'(C) = 0$ or $f'(C)$ does not exist, then the number C is called:	Increasing value	Decreasing value	Stationary value	Critical value
14	$1 + x + \frac{x^2}{\lfloor 2} + \frac{x^3}{\lfloor 3} + \ldots\ldots\ldots$	$\sin x$	$\cos x$	e^x	e^{2x}
15	$\frac{d}{dx}(a^x) =$	a^x	$a^x . \ell na$	$\frac{a^x}{\ell na}$	$\frac{\ell na}{a^x}$
16	The notation $f'(x)$ is used by the mathematician:	Lagrange	Newton	Cauchy	Leibniz
17	$\int \tan x\, dx =$	$\ell n \lvert \sin x \rvert + c$	$\ell n \lvert \cos x \rvert + c$	$\ell n \lvert \sec x \rvert + c$	$\ell n \lvert \tan x \rvert + c$
18	$\int \left(\frac{1}{x} + \frac{\sin 2x}{\sin^2 x} \right) dx =$	$\ell n \sin 2x + c$	$\ell n(x \sin^2 x) + c$	$\ell n(x \cos^2 x) + c$	$\ell n(x \sin 2x) + c$
19	$\int e^{2x} dx =$	$2e^{2x} + c$	$e^{2x} + c$	$2xe^{2x} + c$	$\frac{e^{2x}}{2} + c$
20	$\int_0^{\pi/2} \cos x\, dx =$	0	1	2	3

2023 (1^{st}-A)
INTERMEDIATE PART-II (12^{th} Class)

Roll No:

MATHEMATICS PAPER-II GROUP-I		
TIME ALLOWED: 2.30 Hours	SUBJECTIVE	MAXIMUM MARKS: 80

NOTE: Write same question number and its parts number on answer book, as given in the question paper.

SECTION-I

2. Attempt any eight parts. $8 \times 2 = 16$

(i)	What is a function?	(ii)	Prove the identity $\cosh^2 x - \sinh^2 x = 1$
(iii)	Given that $f(x) = x^3 - 2x^2 + 4x - 1$ find $f\left(\frac{1}{x}\right)$	(iv)	Differentiate w.r.t. x $\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2$
(v)	Find $\frac{dy}{dx}$ if $\sqrt{x+\sqrt{x}}$	(vi)	Find $\frac{dy}{dx}$ if $y = x\cos y$
(vii)	Differentiate $y = e^{f(x)}$ w.r.t. x	(viii)	Differentiate $\sin x$ w.r.t. $\cot x$
(ix)	Find y_4 if $y = \sin 3x$	(x)	What is a stationary point?
(xi)	Define problem constraint.	(xii)	Define feasible region and feasible solution.

3. Attempt any eight parts. $8 \times 2 = 16$

(i)	Find δy and dy, if $y = x^2 - 1$, when x changes from 3 to 3.02.	(ii)	Evaluate $\int \sin(a+b)x\,dx$
(iii)	Evaluate $\int \frac{-2x}{\sqrt{4-x^2}}dx$	(iv)	Evaluate $\int x.\ln x\,dx$
(v)	Evaluate $\int_1^2 (x^2+1)\,dx$	(vi)	Find the area between the $x-$axis and the curve $y = \sin 2x$ from $x = 0$ to $x = \pi/3$
(vii)	Solve $\frac{dy}{dx} = -y$	(viii)	Find the unit vector of $\underline{v} = 2\underline{i} - \underline{j}$
(ix)	Write direction consines of $\underline{v} = 4\underline{i} - 5\underline{j}$	(x)	Find the cosine of the angle θ between $\underline{u}$ and $\underline{v}$, $\underline{u} = [2, -3, 1]$, $\underline{v} = [2, 4, 1]$
(xi)	Prove that $\underline{a} \times (\underline{b} + \underline{c}) + \underline{b} \times (\underline{c} + \underline{a}) + \underline{c} \times (\underline{a} + \underline{b}) = 0$	(xii)	Find the volume of the parallelepiped for which the given vectors are $\underline{u} = \underline{i} + 4\underline{j} - \underline{k}$; $\underline{v} = \underline{i} - \underline{j} - 2\underline{k}$; $\underline{w} = 2\underline{i} - 3\underline{j} + \underline{k}$

4. Attempt any nine parts. $9 \times 2 = 18$

(i)	Find h such that $A(-1, h)$, $B(3, 2)$ and $C(7, 3)$ are collinear.
(ii)	The $xy-$coordinate axes are rotated about the origin through an angle of 30^o. If the $xy-$coordinates of a point are (5, 7), find its $XY-$coordinates, where OX and OY are the axes obtained after rotation.
(iii)	Find the distance between the parallel lines $2x + y + 2 = 0$ and $6x + 3y - 8 = 0$
(iv)	Check whether the point $(-2, 4)$ lies above or below the line $4x + 5y - 3 = 0$
(v)	Find the area of the region bounded by the triangle with vertices $(a, b+c)$, $(a, b-c)$ and $(-a, c)$
(vi)	By means of slopes, show that the following points lie on the same line $(-4, 6)$, $(3, 8)$, $(10, 10)$
(vii)	Find an equation of the line bisecting the first and third quadrants.
(viii)	Find the centre and radius of the circle with the equation $4x^2 + 4y^2 - 8x + 12y - 25 = 0$
(ix)	Find the length of the tangent from the point $P(-5, 10)$ to the circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$
(x)	Write an equation of the parabola with given elements focus $(-3, 1)$, directrix $x - 2y - 3 = 0$
(xi)	Find an equation of the ellipse with vertices $(0, \pm 5)$ and eccentricity $\frac{3}{5}$.
(xii)	Find an equation of the hyperbola with the given data. Foci $(2 \pm 5\sqrt{2}, -7)$ and length of transverse axis 10.
(xiii)	Find an equation of the circle with ends of diameter at $(-3, 2)$ and $(5, -6)$

SECTION-II

NOTE: Attempt any three questions. $3 \times 10 = 30$

5.(a)	Evaluate $\lim_{\theta \to 0} \frac{\tan\theta - \sin\theta}{\sin^3\theta}$	(b)	If $x = a\cos^3\theta$, $y = b\sin^3\theta$ then show that $a\frac{dy}{dx} + b\tan\theta = 0$
6.(a)	Evaluate $\int \frac{dx}{\sqrt{7-6x-x^2}}$	(b)	Find the equation of perpendicular bisector of the segment joining the points $A(3, 5)$ and $B(9, 8)$
7.(a)	Evaluate $\int_{\pi/6}^{\pi/4} \cos^2\theta\cot^2\theta\,d\theta$	(b)	Maximize $f(x, y) = 2x + 3y$ subject to constraints $2x + y \le 8$, $x + 2y \le 14$, $x \ge 0$, $y \ge 0$
8.(a)	If $y = a\cos(\ln x) + b\sin(\ln x)$, prove that $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$		
(b)	Find the length of the chord cut from the line $2x + 3y = 13$ by the circle $x^2 + y^2 = 26$		
9.(a)	Show that an equation of the parabola with focus at $(a\cos\alpha, a\sin\alpha)$ and directrix $x\cos\alpha + y\sin\alpha + a = 0$ is $(x\sin\alpha - y\cos\alpha)^2 = 4a(x\cos\alpha + y\sin\alpha)$		
(b)	Prove that the line segment joining mid points of two sides of a triangle is parallel to third side and half as long.		

Paper Code Number: **4196**	2023 (1^{st}-A) INTERMEDIATE PART-II (12^{th} Class)	Roll No: ____________

MATHEMATICS PAPER-II GROUP-II

TIME ALLOWED: 30 Minutes | **OBJECTIVE** | **MAXIMUM MARKS: 20**

Q.No.1 You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that bubble in front of that question number, on bubble sheet. Use marker or pen to fill the bubbles. Cutting or filling two or more bubbles will result in zero mark in that question.

S.#	QUESTIONS	A	B	C	D
1	Slope of line which is perpendicular to $y-$axis is:	0	1	2	Undefined
2	$y-$intercept of the line $2x+3y-5=0$ is:	$2/5$	$5/2$	$3/5$	$5/3$
3	The point of intersection of medians of a triangle is called:	Incentre	Centroid	Circumcentre	Orthocenter
4	(0, 1) is the solution of inequality:	$x-3y>0$	$x-5y>0$	[illegible]$x+y>0$	$x<0$
5	The end points of minor axis of the ellipse are called its:	Vertices	Co-vertices	Foci	Eccentricity
6	The length of latus rectum of parabola $y^2=-8x$ is:	-8	-4	4	8
7	The vertex of the parabola $(x+1)^2=8(y-2)$ is:	$(-1, 2)$	$(1, -2)$	$(-1, -2)$	$(1, 2)$
8	The length of diameter of the circle $x^2+y^2=16$ is:	4	6	8	16
9	$\bar{u}\times(\bar{v}.\bar{w})$ is:	Scalar product	Vector product	Inner product	Meaningless
10	The value of $[\hat{i}\ \ \hat{j}$ [illegible]	-1	0	1	2
11	$\lim\limits_{x\to-\infty}(e^x)=$	$-\infty$	0	1	$+\infty$
12	$f(x)=\sin x$ is:	Odd function	Even function	Constant function	Linear function
13	If $y=x+\frac{1}{x}$, then $\frac{dy}{dx}=$	$1-\frac{1}{x}$	$\frac{1}{x}-1$	$1-\frac{1}{x^2}$	$\frac{1}{x^2}-1$
14	If $y=\sinh^{-1}x$, then $\frac{dy}{dx}=$	$\frac{1}{\sqrt{x^2+1}}$	$\frac{1}{\sqrt{x^2-1}}$	$\frac{-1}{\sqrt{x^2+1}}$	$\frac{-1}{\sqrt{x^2-1}}$
15	Derivative of $\cos x$ w.r.t. $\cos x$ is:	$-\sin x$	$\sin x$	0	1
16	The function $f(x)=3x^2$ has minimum value at $x=$	-1	0	1	2
17	$\int_{\pi}^{\pi}\sin x\,dx=$	0	1	2	3
18	If $y=x^3$, then $dy=$	$3x^2$	x^2dx	$3x^2dx$	$3xdx$
19	$\int_a^b f(x)dx=$	$\int_b^a f(x)dx$	$-\int_b^a f(x)dx$	$\int_{-a}^{-b} f(x)dx$	$-\int_{-a}^{-b} f(x)dx$
20	$\int\frac{f'(x)}{f(x)}dx=$	$\ell n\, f(x)+c$	$\ell n\, f'(x)+c$	$\ell n\, f(x)f'(x)+c$	$\ell nx+c$

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INTERMEDIATE PART-II (12^{th} Class)	2023 (1^{st}-A)	Roll No: ____________
MATHEMATICS PAPER-II GROUP-II		
TIME ALLOWED: 2.30 Hours	**SUBJECTIVE**	**MAXIMUM MARKS: 80**

NOTE: Write same question number and its parts number on answer book, as given in the question paper.

SECTION-I

2. Attempt any eight parts. $8\times2=16$

(i)	Define a polynomial function of degree n.	(ii)	Determine whether given function f is even or odd $f(x)=x^{2/3}+6$
(iii)	Evaluate $\lim\limits_{n\to\infty}\left(1+\frac{3}{n}\right)^{2n}$	(iv)	Find the derivative of $x^{\frac{2}{3}}$ and also calculate the value of derivative at $x=8$.
(v)	Differentiate w.r.t. x $x^{-3}+2x^{-\frac{3}{2}}+3$	(vi)	Find $\frac{dy}{dx}$ if $xy+y^2=2$
(vii)	Find $\frac{dy}{dx}$ if $x=y\sin y$	(viii)	Differentiate w.r.t. x $x^2\sec 4x$
(ix)	Find $\frac{dy}{dx}$ if $y=e^{x^2+1}$	(x)	State Maclaurin's series expansion.
(xi)	Define optimal solution.	(xii)	Define the associated emotion of an inequality.

3. Attempt any eight parts. $8\times2=16$

(i)	Find δy and dy for $y=x^2-1$, when x changes from 3 to 3.02.	(ii)	Evaluate $\int\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2dx$
(iii)	Evaluate $\int\frac{x^2}{4+x^2}dx$	(iv)	Evaluate $\int x^2\ell nx\,dx$
(v)	Evaluate $\int_{-1}^{1}(x^{\frac{1}{3}}+1)dx$	(vi)	Find the area between the $x-$axis and the curve $y=4x-x^2$
(vii)	Solve the differential equation $\frac{dy}{dx}=\frac{y}{x^2}$	(viii)	Find unit vector in the direction of $\underline{v}=2\underline{i}-\underline{j}$
(ix)	Find vector whose magnitude is 4 and is parallel to $2\underline{i}-3\underline{j}+6\underline{k}$	(x)	Calculate the projection of $\underline{a}=\underline{i}-\underline{k}$ along $\underline{b}=\underline{j}+\underline{k}$
(xi)	Find a unit vector perpendicular to the plane containing $\underline{a}$ and $\underline{b}$, $\underline{a}=\underline{i}+\underline{j}$, $\underline{b}=\underline{i}-\underline{j}$	(xii)	Prove that $\underline{i}-2\underline{j}+3\underline{k}$, $-2\underline{i}+3\underline{j}-4\underline{k}$ and $\underline{i}-3\underline{j}+5\underline{k}$ are coplanar.

4. Attempt any nine parts. $9\times2=18$

(i)	Show that the points $A(3,1)$, $B(-2,-3)$ and $C(2,2)$ are vertices of an isosceles triangle.
(ii)	Show that the points $A(-3,6)$, $B(3,2)$ and $C(6,0)$ are collinear.
(iii)	Find an equation of the straight line if it is perpendicular to a line with slope -6 and its $y-$intercept is $\frac{4}{3}$.
(iv)	Write down an equation of the line which cuts the $x-$axis at $(2,0)$ and $y-$axis at $(0,-4)$.
(v)	Transform the equation $5x-12y+39=0$ into two-intercept form.
(vi)	Check whether the lines $3x-4y-3=0$, $5x+12y+1=0$, $32x+4y-17=0$ are concurrent or not.
(vii)	Find the distance between the parallel lines $l_1: 2x-5y+13=0$ and $l_2: 2x-5y+6=0$
(viii)	Find the centre and radius of the circle with the equation $5x^2+5y^2+14x+12y-10=0$
(ix)	Find the co- ordinates of the points of intersection of the line $2x+y=5$ and the circle $x^2+y^2+2x-9=0$
(x)	Write equations of the tangents to the circle $x^2+y^2-4x+6y+9=0$ at the points on the circle whose ordinate is -2.
(xi)	Find an equation of the parabola whose focus is $F(-3,4)$ and directrix is $3x-4y+5=0$
(xii)	Find an equation of the ellipse having centre at $(0,0)$, focus at $(0,-3)$ and one vertex at $(0,4)$.
(xiii)	Find an equation of hyperbola whose foci are $(\pm4,0)$ and vertices $(\pm2,0)$.

SECTION-II

NOTE: Attempt any three questions. $3\times10=30$

5.(a)	Prove that $\lim\limits_{x\to0}\frac{a^x-1}{x}=\log_e a$	(b)	Find by definition the derivative of $\cos\sqrt{x}$.
6.(a)	Evaluate $\int\frac{x\,dx}{x^4+2x^2+5}$	(b)	Find equations of two parallel lines perpendicular to $2x-y+3=0$ such that product of $x-$ and $y-$intercepts of each is 3.

7.(a)	Find the area bounded by the curve $y=x^3-4x$ and the $x-$axis.
(b)	Maximize $f(x,y)=x+3y$ subject to constraints $2x+5y\le30$, $5x+4y\le20$, $x\ge0$, $y\ge0$
8.(a)	Show that $y=x^x$ has minimum value at $x=\frac{1}{e}$
(b)	Find the equation of the circle passing through the points $A(4,5)$, $B(-4,-3)$, $C(8,-3)$
9.(a)	Find the focus, vertex and directrix of parabola $x^2-4x-8y+4=0$
(b)	Prove that by using vectors method $\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin\beta$

MATHEMATICS PAPER-II TIME ALLOWED: 30 Minutes

GROUP-I Multan Board-2021 OBJECTIVE MAXIMUM MARKS: 20

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that bubble in front of that question number, on bubble sheet. Use marker or pen to fill the bubbles. Cutting or filling two or more bubbles will result in zero mark in that question. No credit will be awarded in case BUBBLES are not filled. Do not solve question on this sheet of OBJECTIVE PAPER.

Q.No.1

(1) When the expression $\sqrt{a^2 - x^2}$ involves in integration substitute, is:
(A) $x = a\sin\theta$ (B) $a\sec\theta$ (C) $a\tan\theta$ (D) $a = \sin\theta$

(2) $\int_0^3 \frac{1}{\sqrt{9 - x^2}}dx =$ (A) $\frac{2}{\pi}$ (B) $\frac{-2}{\pi}$ (C) $\frac{-\pi}{2}$ (D) $\frac{\pi}{2}$

(3) Which of the following is not a solution of the system of inequalities
$x + 2y \le 8,\ 2x - 3y \le 6,\ 2x + y \ge 2 \quad x \ge 0,\ y \ge 0$
(A) (1, 0) (B) (8, 0) (C) (0, 4) (D) (3, 0)

(4) When axes are translated, the coordinates of the point $(-6, 9)$ are changed into $(-3, 7)$, find the point through which axes are translated:
(A) $(-3, 2)$ (B) $(3, -2)$ (C) $(7, -3)$ (D) $(-9, 6)$

(5) The equation of horizontal line passing through $(-5, 3)$ is:
(A) $x + 5 = 0$ (B) $-5x + 3y = 0$ (C) $3x - 5y = 0$ (D) $y - 3 = 0$

(6) A line passes through $(1, 5)$ and $(k, 7)$ has a slope k, the values of k is:
(A) -1 and 2 (B) 3 and -2 (C) 2, -3 (D) $-1, -2$

(7) The focus of the parabola $y^2 = 4ax$ is:
(A) $(a, 0)$ (B) $(0, a)$ (C) $(-a, 0)$ (D) $(0, -a)$

(8) The eccentricity of $\frac{y^2}{4} - x^2 = 1$ equals: (A) $\frac{-2}{\sqrt{5}}$ (B) $\frac{2}{\sqrt{5}}$ (C) $\frac{-\sqrt{5}}{2}$ (D) $\frac{\sqrt{5}}{2}$

(9) Conic are the curves obtained by cutting a right circular cone by:
(A) Sphere (B) A line (C) A plane (D) A curve

(10) If $\underline{a}$ and $\underline{b}$ are two non-zero vectors, then $\underline{a} \times \underline{b} =$ ______
(A) $-\underline{b} \times \underline{a}$ (B) $\underline{a} \cdot \underline{b}$ (C) $-\underline{a} \times -\underline{b}$ (D) $\underline{b} \times \underline{a}$

(11) Angle between the vectors $\underline{i} + \underline{j},\ \underline{i} - \underline{j}$ is: (A) π (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{4}$ (D) 0

(12) Projection of $\underline{a}$ along $\underline{b}$ is:
(A) $\hat{a} \cdot \hat{b}$ (B) $\underline{a} - \underline{b}$ (C) $\underline{a} \cdot \hat{b}$ (D) $\hat{a} \cdot \underline{b}$

(13) If $f(x) = \sqrt{x + 4}$ then $f(x^2 + 4)$ is equal to:
(A) $\sqrt{x^2 + 8}$ (B) $\sqrt{x^2 - 8}$ (C) $\sqrt{x - 8}$ (D) $x^2 - 8$

(14) The function $f(x) = \frac{2 + 3x}{2x}$ is not continuous at: (A) $x = -3$ (B) $x = -2/3$ (C) $x = 1$ (D) $x = 0$

(15) $\lim_{x \to a} \frac{f(x) - f(a)}{x - a} =$ ______ (A) $f'(x)$ (B) $f'(a)$ (C) $f'(0)$ (D) $f'(x - a)$

(16) $f(x) = x^{2/3}$, then $f'(8) =$ ______ (A) $\frac{1}{2}$ (B) $\frac{2}{3}$ (C) $\frac{1}{3}$ (D) 3

(17) The derivative of $\frac{x^3 + 2x^2}{x^3}$ equals: (A) $\frac{2}{x^2}$ (B) $\frac{-2}{x^2}$ (C) $\frac{1}{2x^2}$ (D) $\frac{-1}{2x^2}$

(18) If $f(x) = \tan^{-1}x$, then $f'(\cot x)$ is equal to:
(A) $\frac{1}{1 + x^2}$ (B) $\sin^2 x$ (C) $\cos^2 x$ (D) $sex^2 x$

(19) $f(x + \delta x) =$ ______
(A) $f'(x)dx$ (B) $f(x) - f'(x)dx$ (C) $f(x) + f'(x)dx$ (D) $f(x)dx$

(20) $\int \frac{a}{x\sqrt{x^2 - 1}}dx =$ ______
(A) $a\tan^{-1}x$ (B) $-a\ cosec^{-1}x + c$ (C) $-a\sec^{-1}x + c$ (D) $\frac{1}{a}\sec^{-1}x + c$

MATHEMATICS PAPER-II TIME ALLOWED: 2.30 Hours
GROUP-I **SUBJECTIVE** MAXIMUM MARKS: 80

NOTE: Write same question number and its part number on answer book, as given in the question paper. Multan Board-2021

SECTION-I

2. Attempt any eight parts. **$8 \times 2 = 16$**

(i) Determine whether the function $f(x) = \sin x + \cos x$ is even or odd.

(ii) With out finding the inverse, state domain and range of f^{-1} where $f(x) = \dfrac{x-1}{x-4}$ $x \neq 4$

(iii) Evaluate the limit $\lim\limits_{x \to 2} \dfrac{x^3 - 8}{x^2 + x - 6}$ by using algebraic techniques.

(iv) Express the Limit $\lim\limits_{x \to 0} (1 + 2x^2)^{\frac{1}{x^2}}$ in terms of e.

(v) Find the derivative of $(x+4)^{\frac{1}{3}}$ by definition.

(vi) Differentiate $x^2 - \dfrac{1}{x^2}$ w.r.t x^4.

(vii) If $y = \ell n\,(x + \sqrt{x^2 + 1})$ then find $\dfrac{dy}{dx}$

(viii) If $y = x^2 \cdot e^{-x}$ then find y_2

(ix) If $x = 1 - t^2$ and $y = 3t^2 - 2t^3$ then find $\dfrac{dx}{dt}$ and $\dfrac{dy}{dt}$

(x) If $f(x) = 4 - x^2$, $x \in (-2, 2)$ then find interval in which $f(x)$ is increasing or decreasing.

(xi) Prove that $\dfrac{d}{dx}(\tan^{-1} x) = \dfrac{1}{1+x^2}$

(xii) If $y = \sin 3x$ then find y_4

3. Attempt any eight parts. **$8 \times 2 = 16$**

(i) Using differentials find $\dfrac{dy}{dx}$ and $\dfrac{dx}{dy}$ if $x^2 + 2y^2 = 16$

(ii) Evaluate $\int \cos 3x \sin 2x \, dx$

(iii) Evaluate $\int \dfrac{x^2}{4 + x^2} dx$

(iv) Evaluate $\int x \, \ell nx \, dx$

(v) Evaluate $\int \dfrac{(a-b)x}{(x-a)(x-b)} dx$, $a > b$

(vi) Evaluate $\int_0^3 \dfrac{dx}{x^2 + 9}$

(vii) Solve the differential equation $y\,dx + x\,dy = 0$

(viii) Evaluate $\int \sec x \, dx$

(ix) Find K so that the line joining $A(7, 3)$, $B(K, -6)$ and the line joining $C(-4, 5)$, $D(-6, 4)$ are parallel.

(x) Find whether the given point $P(5, 8)$ lies above or below the line $2x - 3y + 6 = 0$

(xi) Determine value of P such that the lines $2x - 3y - 1 = 0$, $3x - y - 5 = 0$ and $3x + Py + 8 = 0$ meet at a point.

(xii) Find the lines represented by $3x^2 + 7xy + 2y^2 = 0$

4. **Attempt any nine parts.** Multan Board-2021 **$9 \times 2 = 18$**

(i) Graph the solution set of linear inequality in xy-plane $3x - 2y \geq 6$

(ii) Find the equation of a circle with ends of a diameter at $(-3, 2)$ and $(5, -6)$

(iii) Find the centre and radius of a circle $4x^2 + 4y^2 - 8x + 12y - 25 = 0$

(iv) Write down the equation of normal to the circle $x^2 + y^2 = 25$ at $(4, 3)$

(v) Find the vertex and directrix of $x^2 = 4(y - 1)$

(vi) Write the equation of parabola with focus $(-3, 1)$ and directrix $x - 2y - 3 = 0$

(vii) Find the equation of hyperbola with Foci $(\pm 5, 0)$ and vertex is $(3, 0)$

(viii) Find the magnitude of vector $\underline{u} = \underline{i} + \underline{j}$

(ix) Find a unit vector in the direction of $\underline{v} = \underline{i} + 2\underline{j} - \underline{k}$

(x) Find the direction cosines of $\underline{v} = 3\underline{i} - \underline{j} + 2\underline{k}$

(xi) If $\underline{u} = [2, -3, 1]$, $\underline{v} = [2, 4, 1]$ find the cosine of angle θ between $\underline{u}$ and $\underline{v}$

(xii) If $\underline{a} \times \underline{b} = 0$ and $\underline{a} \cdot \underline{b} = 0$, what conclusion can be drawn about $\underline{a}$ or $\underline{b}$?

(xiii) Find α so that $\underline{i} - \underline{j} + \underline{k}$, $\underline{i} - 2\underline{j} - 3\underline{k}$ and $3\underline{i} - \alpha\underline{j} + 5\underline{k}$ are coplanar.

SECTION-II

NOTE: Attempt any three questions. **$3 \times 10 = 30$**

5.(a) If $f(x) = \begin{cases} \dfrac{\sqrt{2x+5} - \sqrt{x+7}}{x-2}, & x \neq 2 \\ K, & x = 2 \end{cases}$ Find the value of K so that f is continuous at $x = 2$

(b) If $x = a\cos^3\theta$, $y = b\sin^3\theta$, show that $a\dfrac{dy}{dx} + b\tan\theta = 0$

6.(a) Evaluate the integral $\displaystyle\int \frac{\sqrt{2}}{\sin x + \cos x}\,dx$

(b) Find the condition that the lines $y = m_1x + c_1$, $y = m_2x + c_2$, $y = m_3x + c_3$ are concurrent.

7. (a) Evaluate $\displaystyle\int_0^{\pi/4} \frac{\sin x - 1}{\cos^2 x}\,dx$

(b) Maximize $f(x, y) = 2x + 5y$ subject to constraints $2y - x \leq 8$, $x - y \leq 4$, $x \geq 0$, $y \geq 0$

8. (a) Write equations of two tangents from $(2, 3)$ to the circle $x^2 + y^2 = 9$

(b) By using vectors prove that $\cos(\alpha + \beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$

9.(a) If $y = (\cos^{-1} x)^2$, prove that $(1 - x^2)y_2 - xy_1 - 2 = 0$

(b) Show that an equation of parabola with focus at $(a\cos\alpha, a\sin\alpha)$ and directrix $x\cos\alpha + y\sin\alpha + a = 0$ is $(x\sin\alpha - y\cos\alpha)^2 = 4a(x\cos\alpha + y\sin\alpha)$

GROUP-II **OBJECTIVE** MAXIMUM MARKS: 20

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that bubble in front of that question number, on bubble sheet. Use marker or pen to fill the bubbles. Cutting or filling two or more bubbles will result in zero mark in that question. No credit will be awarded in case BUBBLES are not filled. Do not solve question on this sheet of OBJECTIVE PAPER.

Q.No.1

(1) The perimeter P of a square as a function of its area A is:
(A) $P = \sqrt{A}$ (B) $P = 2\sqrt{A}$ (C) $P = 3\sqrt{A}$ (D) $P = 4\sqrt{A}$

(2) $\lim_{x \to 3} \dfrac{x-3}{\sqrt{x} - \sqrt{3}}$ (A) $\sqrt{3}$ (B) $2\sqrt{3}$ (C) $\dfrac{1}{\sqrt{3}}$ (D) $\dfrac{1}{2\sqrt{3}}$

(3) If $3x + 4y - 5 = 0$, then $\dfrac{dy}{dx} =$ (A) $4/3$ (B) $-4/3$ (C) $3/4$ (D) $-3/4$

(4) $\dfrac{d}{dx}(\sqrt{\cot x}) =$ (A) $\dfrac{1}{2\sqrt{\cot x}}$ (B) $\dfrac{\operatorname{cosec}^2 x}{2\sqrt{\cot x}}$ (C) $\dfrac{-\operatorname{cosec}^2 x}{2\sqrt{\cot x}}$ (D) $\dfrac{2\operatorname{cosec}^2 x}{\sqrt{\cot x}}$

(5) If $f(x) = \tan^{-1} x$, then $f'(\cot x) =$ (A) $\sin^2 x$ (B) $\cos^2 x$ (C) $\sec^2 x$ (D) $\dfrac{1}{1+x^2}$

(6) $\dfrac{d}{dx}(-\cot x) =$ (A) $\sec^2 x$ (B) $\operatorname{cosec}^2 x$ (C) $-\operatorname{cosec}^2 x$ (D) $\tan^2 x$

(7) $\int a^x dx =$ (A) $a^x + c$ (B) $a^x + \ell na + c$ (C) $a^x \cdot \ell na + c$ (D) $a^x \cdot \dfrac{1}{\ell na} + c$

(8) The anti-derivative of $\dfrac{1}{(1+x^2)\tan^{-1} x}$ is:
(A) $\ell n(\tan^{-1} x) + c$ (B) $\ell n(1+x^2) + c$ (C) $2(\tan^{-1} x)^2 + c$ (D) $\dfrac{1}{2}(\tan^{-1} x)^2 + c$

(9) Suitable substitution for solving $\int \dfrac{1}{x\sqrt{x^2 - a^2}} dx$ is:
(A) $x = a\sin\theta$ (B) $x = a\tan\theta$ (C) $x = a\sec\theta$ (D) $x = a\cos\theta$

(10) $\int_0^{\pi/4} \sec^2 x \, dx =$ (A) 0 (B) 1 (C) 2 (D) $\dfrac{1}{2}$

(11) If $(3, 5)$ is the mid-point of $(5, a)$ and $(1, 7)$, then $a =$ ____ (A) 3 (B) 5 (C) 7 (D) 9

(12) The point $(3, -8)$ lies in the ______ quadrant. (A) 1^{st} (B) 2^{nd} (C) 3^{rd} (D) 4^{th}

(13) The lines ℓ_1 and ℓ_2 with slopes m_1 and m_2 respectively, are parallel if:
(A) $m_1 m_2 = 1$ (B) $m_1 = m_2$ (C) $m_1 m_2 = -1$ (D) $m_1 + m_2 = 0$

(14) The point $(2, 1)$ is not in the solution of the inequality:
(A) $2x + y > 3$ (B) $2x + y > 4$ (C) $2x + y < 3$ (D) $2x + y > 1$

(15) Centre of the circle $x^2 + y^2 + 7x - 3y = 0$, is:
(A) $(7, -3)$ (B) $\left(-7/2, 3/2\right)$ (C) $(-7, 3)$ (D) $\left(7/2, -3/2\right)$

(16) The equation of directrix of the parabola $x^2 = 5y$ is:
(A) $x + 5/4 = 0$ (B) $x - 5/4 = 0$ (C) $y + 5/4 = 0$ (D) $y - 5/4 = 0$

(17) The length of latus-rectum of hyperbola $\dfrac{x^2}{a^2} - \dfrac{y^2}{b^2} = 1$, is:
(A) $\dfrac{a^2}{2b}$ (B) $\dfrac{b^2}{2a}$ (C) $\dfrac{b^2}{a}$ (D) $\dfrac{2b^2}{a}$

(18) If $\underline{u} = 2\alpha\underline{i} + \underline{j} - \underline{k}$ and $\underline{v} = \underline{i} + \alpha\underline{j} + 4\underline{k}$, are perpendicular, then $\alpha =$
(A) $-4/3$ (B) $4/3$ (C) $3/4$ (D) 4

(19) The vectors $\underline{u}$, $\underline{v}$ and $\underline{w}$ are coplanar if:
(A) $\underline{u} \cdot \underline{v} \times \underline{w} = 0$ (B) $\underline{u} \cdot \underline{v} \times \underline{w} = 1$ (C) $\underline{u} \cdot \underline{v} \times \underline{w} = 2$ (D) $\underline{u} \cdot \underline{v} \times \underline{w} = 3$

(20) Work done by a constant force $\vec{F}$ during a displacement $\vec{d}$ is equal to:
(A) $\vec{F} \times \vec{d}$ (B) $\vec{d} \times \vec{F}$ (C) $\vec{F} + \vec{d}$ (D) $\vec{F} \cdot \vec{d}$

GROUP-II **SUBJECTIVE** MAXIMUM MARKS: 80

NOTE: Write same question number and its part number on answer book, as given in the question paper.

SECTION-I

2. Attempt any eight parts. $8 \times 2 = 16$

(i) Express perimeter P of a square as a function of its area A.

(ii) If $f(x) = \sqrt{x+1}$, $g(x) = \frac{1}{x^2}$ find $fog(x)$, $gof(x)$

(iii) Evaluate $\lim\limits_{x \to -1} \frac{x^3 - x}{x+1}$

(iv) Evaluate $\lim\limits_{x \to 0} \frac{1 - \cos x}{\sin^2 x}$

(v) Differentiate $\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2$ w.r.t. x

(vi) Find $\frac{dy}{dx}$ if $x = 1 - t^2$, $y = 3t^2 - 2t^3$

(vii) Prove that $\frac{d}{dx}(\tan^{-1} x) = \frac{1}{1+x^2}$

(viii) Find $\frac{dy}{dx}$ if $y = x \cos y$

(ix) Find $\frac{dy}{dx}$ if $y = \frac{x}{\ell nx}$

(x) Find $f'(x)$ if $f(x) = e^{\sqrt{x} - 1}$

(xi) Find y_2 if $y = x^2 e^{-x}$

(xii) Find Maclaurin series for $\sin x$.

3. Attempt any eight parts. $8 \times 2 = 16$

(i) Use differentials to find dy and δy if $y = x^2 + 2x$, x changes from 2 to 1.8.

(ii) Find $\int \frac{1 - \sqrt{x}}{\sqrt{x}} \, dx$

(iii) Find $\int \frac{1 - x^2}{1 + x^2} \, dx$

(iv) Find $\int \frac{\cot \sqrt{x}}{\sqrt{x}} \, dx$

(v) Find $\int \frac{\sqrt{2}}{\sin x + \cos x} \, dx$

(vi) Find $\int x \, \ell nx \, dx$

(vii) Solve the differential equation $(e^x + e^{-x}) \frac{dy}{dx} = e^x - e^{-x}$

(viii) Find $\int_0^{\pi/3} \cos^2 \theta \sin \theta \, d\theta$

(ix) By means of slope, show that $(-1, -3)$, $(1, 5)$, $(2, 9)$ lie on the same line.

(x) Check whether the point $(-7, 6)$ lies above or below the line $4x + 3y - 9 = 0$

(xi) Check whether the lines $12x + 35y - 7 = 0$ and $105x - 36y + 11 = 0$ are parallel or perpendicular.

(xii) Express $15y - 8x + 3 = 0$ in normal form.

(i) Graph the solution set of $3x - 2y \geq 6$

(ii) Find an equation of the circle with ends of a diameter at $(-3, 2)$ and $(5, -6)$

(iii) Find the radius of the circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$

(iv) Find the length of the tangent drawn from the point $(-5, 4)$ to the circle $5x^2 + 5y^2 - 10x + 15y - 131 = 0$

(v) Find the focus and directrix of the parabola $x^2 = 4(y-1)$

(vi) Find the foci and eccentricity of $\frac{y^2}{16} - \frac{x^2}{9} = 1$

(vii) Write down the equation of tangent to $3x^2 + 3y^2 + 5x - 13y + 2 = 0$ at $\left(1, \frac{10}{3}\right)$

(viii) Find the magnitude of the vector $\vec{u} = \hat{i} + \hat{j}$

(ix) Find a unit vector in the direction of $\underline{v} = 2\underline{i} - \underline{j}$

(x) Let $\underline{v} = 3\underline{i} - 2\underline{j} + 2k$, $\underline{w} = 5\underline{i} - \underline{j} + 3\underline{k}$ find $\underline{v} - 3\underline{w}$

(xi) Find α so that $\left|\alpha\underline{i} + (\alpha+1)\underline{j} + 2\underline{k}\right| = 3$

(xii) Find the direction cosines of $\underline{v} = 3\underline{i} - \underline{j} + 2\underline{k}$

(xiii) Find a vector of lengths 5 in the direction opposite that of $\underline{v} = \underline{i} - 2\underline{j} + 3\underline{k}$

SECTION-II

NOTE: Attempt any three questions. **$3 \times 10 = 30$**

5.(a) Prove that $y\frac{dy}{dx} + x = 0$ if $x = \frac{1-t^2}{1+t^2}$, $y = \frac{2t}{1+t^2}$

(b) If $f(x) = \begin{cases} \frac{\sqrt{2x+5} - \sqrt{x+7}}{x-2}, & x \neq 2 \\ K, & x = 2 \end{cases}$ find value of K so that f is continuous at $x = 2$

6.(a) Determine value of p such that the lines $2x - 3y - 1 = 0$, $3x - y - 5 = 0$ and $3x + py + 8 = 0$ meet at a point.

(b) Evaluate $\int x^3 e^{5x}\, dx$

7. (a) Evaluate $\int_{-1}^{2} (x + |x|)\, dx$

(b) Minimize $z = 2x + y$; subject to the constraints $x + y \geq 3$; $7x + 5y \leq 35$; $x \geq 0$, $y \geq 0$

8. (a) Show that the circles $x^2 + y^2 + 2x - 2y - 7 = 0$ and $x^2 + y^2 - 6x + 4y + 9 = 0$ touch externally.

(b) A force of magnitude 6 units acting parallel to $2\underline{i} - 2\underline{j} + \underline{k}$, displaces, the point of application from $(1, 2, 3)$ to $(5, 3, 7)$. Find work done.

9.(a) A box with a square base and open top is to have a volume of 4 cubic dm. Find the dimensions of the box which will require the least material.

(b) Find the centre, foci and vertices of the following $9x^2 - 12x - y^2 - 2y + 2 = 0$

aper Code lumber: 4195	2019 (A) INTERMEDIATE PART-II (12^{th} CLASS)	Roll No: ________

MATHEMATICS PAPER-II TIME ALLOWED: 30 Minutes
GROUP-I **OBJECTIVE** MAXIMUM MARKS: 20

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that bubble in front of that question number. Use marker or pen to fill the bubbles. Cutting or filling two or more bubbles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank. No credit will be awarded in case BUBBLES are not filled. Do not solve questions on this sheet of OBJECTIVE PAPER.

Q.No.1

(1) $\int_1^2 2x\,dx =$ (A) 3 (B) 2 (C) 1 (D) 0

(2) $\int_1^2 \frac{1}{x}dx =$ (A) $2\ell nx$ (B) $\ell n2$ (C) $\ell n(1)$ (D) $\ell n3$

(3) $\int 5^{2x}\,dx =$ (A) 5^{2x} (B) $2(5^{2x})$ (C) $5^{2x}\ell n5$ (D) $2(5^{2x}\ell n5)$

(4) Distance of line $x+2y+5=0$ from origin is:- (A) 1 (B) $\sqrt{5}$ (C) 5 (D) 2

(5) Length of perpendicular from (1, 1) to the line $4x-3y+9=0$ equals:-
(A) 2 (B) 4 (C) 3 (D) 9

(6) Equation of horizontal line through (2, 3) is:- (A) $y=3$ (B) $y=2$ (C) $x=3$ (D) $x=2$

(7) Slope of vertical line is:- (A) 0 (B) 1 (C) ∞ (D) 2

(8) If $3x+2y\le 6$, point does not satisfy:- (A) (1 , 0) (B) (0 , 1) (C) (0 , 0) (D) (3 , 2)

(9) Radius of circle $x^2+y^2-4x-6y=0$ is:- (A) $\sqrt{13}$ (B) $\sqrt{11}$ (C) $\sqrt{5}$ (D) 13

(10) Directrix of parabola $x^2=20y$ is:- (A) $x=10$ (B) $x=5$ (C) $y=-5$ (D) $x=-5$

(11) Parabola $x^2=-8y$ opens:-
(A) Rightwards (B) Leftwards (C) Upwards (D) Downwards

(12) Magnitude of vector $6\underline{i}+3\underline{j}-2\underline{k}$ is:- (A) 7 (B) 6 (C) 3 (D) -2

(13) Direction cosines of $y-$axis are:-
(A) 0, 0, 1 (B) 1, 0, 0 (C) 0, 1, 0 (D) $\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}$

(14) If $f(x)=x^3+x$, then $f(x)$ is:-
(A) Constant function (B) Even function (C) Odd function (D) Implicit function

(15) $\lim_{x\to 4}\frac{x^2-6x+8}{x-4}=$ (A) 4 (B) 2 (C) 6 (D) 8

(16) $x=3\cos t,\ \ y=3\sin t$ represents:- (A) Line (B) Circle (C) Ellipse (D) Hyperbola

(17) If $f(x)=\sin x$, then $f''\left(\pi/2\right)=$ (A) 0 (B) 1 (C) 2 (D) -1

(18) $\frac{d}{dx}(\coth x)=$ (A) $-\text{cosech}^2x$ (B) cosech^2x (C) $\tanh^2x$ (D) $\coth x\ \text{sech}\,x$

(19) $\frac{d}{dx}(e^{x^2})=$ (A) e^{x^2} (B) $2e^{x^2}$ (C) $2xe^{x^2}$ (D) $2e^x$

(20) $\int\frac{\sin 2x}{4\sin x}dx =$ (A) $\sin 2x+c$ (B) $2\sin 2x+c$ (C) $\frac{1}{2}\sin x+c$ (D) $2\sin x+c$

2019 (A) Roll No: ____________

INTERMEDIATE PART-II (12^{th} CLASS)

MATHEMATICS PAPER-II TIME ALLOWED: 2.30 Hours

GROUP-I **SUBJECTIVE** MAXIMUM MARKS: 80

NOTE: - Write same question number and its part number on answer book, as given in the question paper.

SECTION-I

2. Attempt any eight parts. $8 \times 2 = 16$

(i) Find the domain and range of $f(x) = \sqrt{x^2 - 4}$

(ii) If $f(x) = 2x + 1$, $g(x) = x^2 - 1$, find $g o f(x)$

(iii) Evaluate $\lim\limits_{x \to 0} \dfrac{1 - \cos x}{\sin^2 x}$

(iv) Differentiate $\dfrac{x^2 + 1}{x^2 - 3}$ w.r.t x

(v) If $y = x^4 + 2x^2 + 2$, then show that $\dfrac{dy}{dx} = 4x\sqrt{y - 1}$

(vi) Find $\dfrac{dy}{dx}$ if $y^2 - xy - x^2 + 4 = 0$

(vii) Differentiate $x^2 - \dfrac{1}{x^2}$ w.r.t x^4

(viii) If $y = \sin^2 x$, $u = \sin x$, then find $\dfrac{dy}{du}$

(ix) Find $\dfrac{dy}{dx}$ if $y = x\cos y$

(x) Find $f'(x) = ?$, if $f(x) = \ln(e^x + e^{-x})$

(xi) Define Critical Value.

(xii) State the Maclaurin's Series.

3. Attempt any eight parts. $8 \times 2 = 16$

(i) Find δy if $y = x^2 + 2x$ when x changes from 2 to 1.8.

(ii) Evaluate $\displaystyle\int \frac{dx}{\sqrt{x+1} - \sqrt{x}}$, $x > 0$

(iii) Evaluate $\displaystyle\int \sqrt{1 - \cos 2x}\, dx$, $1 - \cos 2x > 0$

(iv) Evaluate $\displaystyle\int \frac{x}{\sqrt{4 + x^2}}\, dx$

(v) Evaluate $\displaystyle\int \frac{ax}{\sqrt{a^2 - x^4}}\, dx$

(vi) Evaluate $\displaystyle\int (\ln x)^2\, dx$

(vii) Evaluate $\displaystyle\int_1^2 \frac{x}{x^2 + 2}\, dx$

(viii) Evaluate $\displaystyle\int_0^3 \frac{dx}{x^2 + 9}$

(ix) Solve $\sec x + \tan y \dfrac{dy}{dx} = 0$

(x) Find the area between the x-axis and the curve $y = \cos\dfrac{x}{2}$ from $x = -\pi$ to π.

(xi) Draw the graph and shade solution region for $5x - 4y \le 20$

(xii) Define Optimal Solution.

P.T.O.

4. **Attempt any nine parts.** $9 \times 2 = 18$

(i) Find the mid point of the line segment joining the points $\left(-\sqrt{5}, -\frac{1}{3}\right)$ and $\left(-3\sqrt{5}, 5\right)$

(ii) Find 'K' so that line joining the points $A(7, 3)$ and $B(K, -6)$ has a slope $\frac{1}{2}$.

(iii) Find the equation of line passing through the point $(-9, 0)$ and has a slop -4.

(iv) Define 'Homogeneous equation' of degree n where 'n' is a positive integer.

(v) Find the equation of circle with centre $(-3, 5)$ and radius 7.

(vi) Find the coordinates of vertex and focus of the parabola $x^2 = 4(y-1)$

(vii) Find the equation of Ellipse having foci $(\pm 3, 0)$ and minor axis of length 10.

(viii) Find the coordinates of foci and vertices of Hyperbola $\frac{x^2}{4} - \frac{y^2}{9} = 1$

(ix) Define "Position Vector" of a point..

(x) If $\left|\alpha \underline{i} + (\alpha+1)\underline{j} + 2\underline{k}\right| = 3$, then find value of '$\alpha$'.

(xi) Find 'α' so that the vectors $2\underline{i} + \alpha\underline{j} + 5\underline{k}$ and $3\underline{i} + \underline{j} + \alpha\underline{k}$ are perpendicular.

(xii) Find $\underline{a} \times \underline{b}$ if $\underline{a} = 2\underline{i} + \underline{j} - \underline{k}$ and $\underline{b} = \underline{i} - \underline{j} + \underline{k}$

(xiii) Prove that the vectors $\underline{i} - 2\underline{j} + 3\underline{k}$, $-2\underline{i} + 3\underline{j} - 4\underline{k}$ and $\underline{i} - 3\underline{j} + 5\underline{k}$ are coplanar.

SECTION-II

NOTE: - Attempt any three questions. $3 \times 10 = 30$

5.(a) Prove that $\lim_{\theta \to 0} \frac{\sin\theta}{\theta} = 1$, θ is measured in radians.

(b) Find the extreme values for the function $f(x) = (x-2)^2(x-1)$

6.(a) Show that $\int \sqrt{a^2 - x^2}\,dx = \frac{a^2}{2} Sin^{-1}\frac{x}{a} + \frac{x}{2}\sqrt{a^2 - x^2} + c$

(b) The points $(4, -2)$, $(-2, 4)$ and $(5, 5)$ are the vertices of a triangle. Find in-centre of the triangle.

7. (a) Evaluate $\int_{\frac{1}{2}}^{\frac{\sqrt{3}}{2}} \frac{Sin^{-1}x}{\sqrt{1-x^2}}\,dx$ $\quad x \neq 1, -1$

(b) Graph the feasible region of the following system of linear inequalities and find the corner points

$2x - 3y \le 6$

$2x + 3y \le 12$

$x \ge 0$

$y \ge 0$

8. (a) Find an equation of the line through the intersection of the lines $x - y - 4 = 0$ and $7x + y + 20 = 0$ and parallel to the line $6x + y - 14 = 0$

(b) Show that the circles $x^2 + y^2 + 2x - 2y - 7 = 0$ and $x^2 + y^2 - 6x + 4y + 9 = 0$ touch externally.

9.(a) Find an equation of the parabola having focus at $(-3, 1)$ and directrix is $x = 3$.

(b) Prove that the line segment joining the mid points of the sides of a quadrilateral taken in order form a parallelogram.

Paper Code Number: 4192

2019 (A)

Roll No: ______________

INTERMEDIATE PART-II (12th CLASS)

MATHEMATICS PAPER-II
GROUP-II

TIME ALLOWED: 30 Minutes
MAXIMUM MARKS: 20

OBJECTIVE

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that bubble in front of that question number. Use marker or pen to fill the bubbles. Cutting or filling two or more bubbles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank. No credit will be awarded in case BUBBLES are not filled. Do not solve questions on this sheet of OBJECTIVE PAPER.

Q.No.1

(1) If $f(x)=x^2+\cos x$, then $f(x)$ is:-
(A) Constant function (B) Even function (C) Odd function (D) Linear function

(2) If $f(x)=x^3-2x^2+4x-1$, then $f(-2)$:- (A) 14 (B) -14 (C) -25 (D) 25

(3) $\frac{d}{dx}(4x+7)^9=$
(A) $36(4x+7)^8$ (B) $36(4x+7)^9$ (C) $28(4x+7)^8$ (D) $63(4x+7)^8$

(4) If $f(x)=2^{2x}$, then $f'(x)=$
(A) 2^{2x-1} (B) $2^{2x}\ell n2$ (C) $2^{2x+1}\ell n2$ (D) $\frac{2^{2x}}{\ell n2}$

(5) $\frac{d}{dx}\left(Cos^{-1}\frac{x}{a}\right)=$
(A) $\frac{1}{1-x^2}$ (B) $\frac{1}{1+x^2}$ (C) $\frac{1}{\sqrt{a^2-x^2}}$ (D) $\frac{-1}{\sqrt{a^2-x^2}}$

(6) If $f(x)=x^{10}$, then $f''(1)=$ (A) 90 (B) 9 (C) 10 (D) 100

(7) $\int\frac{1}{x^2}dx=$ (A) $\ell nx+c$ (B) ℓnx^2+c (C) $\frac{-2}{x^3}+c$ (D) $\frac{-1}{x}+c$

(8) $\int\tan\frac{\pi}{4}dx=$ (A) $\ell n\left(\sin\frac{\pi}{4}\right)+c$ (B) $x+c$ (C) $\sec^2\frac{\pi}{4}$ (D) 1

(9) $\int\sec^2 2x dx=$ (A) $\frac{1}{2}\tan 2x$ (B) $\tan 2x$ (C) $\frac{1}{2}\tan x$ (D) $2\tan 2x$

(10) $\int_0^{\frac{3\pi}{2}}\cos x\, dx=$ (A) 0 (B) 1 (C) -1 (2) 2

(11) Distance of line $5x+12y+39=0$ from $(0,0)$ is:- (A) 3 (B) 5 (C) 12 (D) 39

(12) Equation of horizontal line through (a,b) is:-
(A) $y=a$ (B) $y=b$ (C) $x=a$ (D) $x=b$

(13) The line $ax+by+c=0$ will represent equation of straight line parallel to y – axis if:-
(A) $a=0$ (B) $b=0$ (C) $c=0$ (D) $a=b$

(14) Point $\left(+\frac{3}{7},-\frac{5}{7}\right)$ lies in:- (A) I quadrant (B) II quadrant (C) III quadrant (D) IV quadrant

(15) The point (1, 2) satisfies the inequality:-
(A) $x+2y>3$ (B) $x-2y>3$ (C) $x-2y>5$ (D) $x+2y<3$

(16) Radius of circle $x^2+y^2+4x+2y-4=0$ is:- (A) 3 (B) 2 (C) 4 (D) 1

(17) Latus rectum of parabola $x^2=8y$ is:-
(A) $y=-2$ (B) $y=2$ (C) $x=2$ (D) $x=-2$

(18) Major axis of ellipse $\frac{x^2}{8}+\frac{y^2}{12}=1$ is:- (A) $2\sqrt{3}$ (B) 8 (C) $4\sqrt{3}$ (D) 5

(19) Direction cosines of x – axis are:- (A) 1, 1, 0 (B) 1, 0, 1 (C) 1, 0, 0 (D) 0, 0, 1

(20) $[\underline{k}\ \ \underline{i}\ \ \underline{j}]=$ (A) 3 (B) 0 (C) -2 (D) 1

16(Obj)(☆)-2019(A)-6000 (MULTAN)

2019 (A) Roll No:

INTERMEDIATE PART-II (12^{th} CLASS)

MATHEMATICS PAPER-II TIME ALLOWED: 2.30 Hours

GROUP-II **SUBJECTIVE** MAXIMUM MARKS: 80

NOTE: - Write same question number and its part number on answer book,

SECTION-I

2. Attempt any eight parts. $8 \times 2 = 16$

(i) Find the domain and range of $f(x) = |x - 3|$

(ii) If $f(x) = 3x^4 - 2x^2$, $g(x) = \frac{2}{\sqrt{x}}$, $x \neq 0$, find $gof(x)$

(iii) Evaluate $\lim_{\theta \to 0} \frac{1 - \cos\theta}{\sin\theta}$

(iv) Differentiate $\frac{2x - 3}{2x + 1}$ w.r.t x.

(v) If $y = (x - 5)(3 - x)$, then find $\frac{dy}{dx}$

(vi) If $x^2 + y^2 = 4$, then show that $\frac{dy}{dx} = \frac{-x}{\sqrt{4 - x^2}}$

(vii) Differentiate $(1 + x^2)^n$ w.r.t x^2

(viii) If $y = \sin x$, $u = \cot x$, then find $\frac{dy}{du}$

(ix) Show that $\frac{dy}{dx} = \frac{y}{x}$, if $\frac{y}{x} = Tan^{-1}\frac{y}{x}$

(x) Find $f'(x)$, if $f(x) = e^{\sqrt{x} - 1}$

(xi) Define Critical Point.

(xii) State the Taylor's Series.

3. Attempt any eight parts. $8 \times 2 = 16$

(i) Find δy if $y = \sqrt{x}$ when x changes from 4 to 4.41.

(ii) Evaluate $\int \frac{3 - \cos 2x}{1 + \cos 2x} dx$ $(\cos 2x \neq -1)$

(iii) Evaluate $\int \frac{(1 + e^x)^3}{e^x} dx$

(iv) Evaluate $\int \frac{\cot\sqrt{x}}{\sqrt{x}} dx$, $x > 0$

(v) Evaluate $\int \frac{\sec^2 x}{\sqrt{\tan x}} dx$

(vi) Evaluate $\int x \sin x \, dx$

(vii) Evaluate $\int_{-2}^{0} \frac{1}{(2x - 1)^2} dx$

(viii) Evaluate $\int_{1}^{2} \ln x \, dx$

(ix) Solve $\sin y \operatorname{cosec} x \frac{dy}{dx} = 1$

(x) Find Area bounded by cos function from $x = \frac{-\pi}{2}$ to $x = \frac{\pi}{2}$

(xi) Graph the Solution Region for $3x - 2y \geq 6$

(xii) Define "Objective Function".

 P.T.O.

4. Attempt any nine parts. **$9 \times 2 = 18$**

(i) Find the co-ordinates of the point that divides the join of $A(-6, 3)$ and $B(5, -2)$ in the ratio 2:3 internally.

(ii) Convert equation $4x + 7y - 2 = 0$ into two intercepts form.

(iii) Show that the point $(-2, 4)$ lies above the line $4x + 5y - 3 = 0$.

(iv) Define 'Medians' of triangle.

(v) Find the slope of tangent to circle $x^2 + y^2 = 25$ at point $(4, 3)$.

(vi) Find the co-ordinates of vertex and focus of the parabola $y = 6x^2 - 1$

(vii) Find the equation of the Ellipse with foci $(\pm 3\sqrt{3}, 0)$ and vertices $(\pm 6, 0)$

(viii) Find the equation of the Hyperbola with the centre $(0, 0)$ Foci $(\pm 6, 0)$ and Vertices $(\pm 4, 0)$.

(ix) If $\overline{AB} = \overline{CD}$. Find the coordinates of the point A when points B, C, D are $(1, 2), (-2, 5), (4, 11)$ respectively.

(x) Find a vector of length 5 in the direction opposite that of $\underline{v} = \underline{i} - 2\underline{j} + 3\underline{k}$.

(xi) Find value of 'α' so that vectors $\alpha\underline{i} + 2\alpha\underline{j} + \underline{k}$ and $\underline{i} + \alpha\underline{j} + 3\underline{k}$ are perpendicular.

(xii) Define direction angles of a vector.

(xiii) Find $\underline{u} \cdot (\underline{v} \times \underline{w})$ when $\underline{u} = [3, 0, 2]$; $\underline{v} = [1, 2, 1]$ and $\underline{w} = [0, -1, 4]$

SECTION-II

NOTE: - Attempt any three questions. **$3 \times 10 = 30$**

5.(a) Evaluate $\lim\limits_{\theta \to 0} \dfrac{\tan\theta - \sin\theta}{\sin^3\theta}$

(b) If $x = a\cos^3\theta$, $y = b\sin^3\theta$ show that $a\dfrac{dy}{dx} + b\tan\theta = 0$

6.(a) Evaluate $\displaystyle\int \frac{7x - 1}{(x-1)^2 (x \quad 1)} dx \qquad x > 1$

(b) Find equations of the altitudes of the triangle whose vertices are $A(-3, 2)$, $B(5, 4)$, $C(3, -8)$

7. (a) Determine the area bounded by the parabola $y = x^2 + 2x - 3$ and the x-axis.

(b) Graph the feasible region of the following system of linear inequalities

$3x + 7y \le 21$

$x - y \le 3$

$x \ge 0$

$y \ge 0$

8. (a) Find the lines represented by $3x^2 + 7xy + 2y^2 = 0$. Also find measure of the angle between them.

(b) Find an equation of the circle that passes through $A(4, 5)$, $B(-4, -3)$, $C(8, -3)$

9.(a) Show that the equation $9x^2 - 18x + 4y^2 + 8y - 23 = 0$ represents an ellipse. Find its elements.

(b) Using vector method, in any triangle ABC prove that $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

16-2019(A)-6000 (MULTAN)

Paper Code Number: 4195	2018 (A) INTERMEDIATE PART-II (12th CLASS)	Roll No: Multan Board-2018

MATHEMATICS PAPER-II TIME ALLOWED: 30 Minutes

GROUP-I **OBJECTIVE** MAXIMUM MARKS: 20

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that bubble in front of that question number. Use marker or pen to fill the bubbles. Cutting or filling two or more bubbles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank. No credit will be awarded in case BUBBLES are not filled. Do not solve questions on this sheet of OBJECTIVE PAPER.

Q.No.1

(1) Distance of the point $(3,-7)$ from $x-$axis is:- (A) 3 (B) -3 (C) 7 (D) -7

(2) Inclination of a line perpendicular to $y-$axis is:- (A) 0^o (B) 60^o (C) 30^o (D) 90^o

(3) The slope of a line which is perpendicular to the line $ax+by+c=0$ is:-
(A) $\frac{-a}{b}$ (B) $\frac{b}{a}$ (C) $\frac{-b}{a}$ (D) $\frac{a}{b}$

(4) The point of concurrency of altitudes of a triangle is called:-
(A) In – Centre (B) Orthocentre (C) Circumcentre (D) Centroid

(5) The graph of $2x \geq 3$ lies in:-
(A) Upper Half Plane (B) Lower Half Plane (C) Left Half Plane (D) Right Half Plane

(6) Length of the diameter of the circle $(x+8)^2+(y-5)^2=80$ is:-
(A) 160 (B) $4\sqrt{5}$ (C) $8\sqrt{5}$ (D) 40

(7) Directrix of Parabola $x^2=-16y$ is:-
(A) $x+4=0$ (B) $x-4=0$ (C) $y-4=0$ (D) $y+4=0$

(8) $x=a\cos\theta,\quad y=b\sin\theta$ represent:- (A) Circle (B) Parabola (C) Ellipse (D) Hyperbola

(9) A unit vector perpendicular to the vectors $\underline{a}$ and $\underline{b}$ is:-
(A) $\frac{\underline{a}\times\underline{b}}{|\underline{a}||\underline{b}|}$ (B) $\frac{\underline{a}\times\underline{b}}{|\underline{a}\times\underline{b}|}$ (C) $\frac{|\underline{a}||\underline{b}|}{|\underline{a}\times\underline{b}|}$ (D) $\frac{|\underline{a}\times\underline{b}|}{|\underline{a}||\underline{b}|}$

(10) $\left[\hat{k}\ \hat{i}\ \hat{j}\right]=$ (A) 1 (B) 2 (C) -1 (D) -2

(11) $Log_e\left(\frac{1}{x}+\frac{\sqrt{1-x^2}}{x}\right)=$ -------, $0<x\leq1$
(A) $Sech^{-1}x$ (B) $Cosech^{-1}x$ (C) $Tanh^{-1}x$ (D) $Coth^{-1}x$

(12) The linear function $f(x)=ax+b$ becomes identity function if:-
(A) $a=0,\ b=1$ (B) $a=1,\ b=0$ (C) $a=0,\ b=0$ (D) $a=1,\ b=1$

(13) If $y=e^{f(x)}$ then $y'=$
(A) $e^{f'(x)}.f(x)$ (B) $e^{f(x)}.f'(x)$ (C) $e^{f'(x)}.\log f(x)$ (D) $e^{f'(x)}.f'(x)$

(14) For relative maxima at $x=c$
(A) $f(c)<f(x)$ (B) $f(c)>f(x)$ (C) $f(c)\geq f(x)$ (D) $f(c)\leq f(x)$

(15) If $f'(a-\varepsilon)<0$ and $f'(a+\varepsilon)<0$ then at $x=a$ $f(x)$ has:-
(A) Relative Minima (B) Relative Maxima (C) Point of Inflexion (D) Critical Point

(16) $\frac{1}{2}\frac{d}{dx}\left[Tan^{-1}x-Cot^{-1}x\right]=$
(A) $\frac{-1}{1+x^2}$ (B) $\frac{1}{1+x^2}$ (C) $\frac{1}{1-x^2}$ (D) $\frac{-1}{1-x^2}$

(17) $\int\frac{\log_e Tanx}{Sin2x}.dx=$ (A) $\frac{1}{2}(\log_e(Tanx))^2+c$
(B) $\frac{1}{4}(\log_e(Tanx))^2+c$ (C) $\frac{1}{2}\log_e(Sin2x)^2+c$ (D) $\frac{1}{4}\log_e(Sin2x)^2+c$

(18) $\int e^{-x}(Cosx-Sinx)dx=$
(A) $e^{-x}Sinx+c$ (B) $-e^{-x}Sinx+c$ (C) $e^{-x}Cosx+c$ (D) $-e^{-x}Cosx+c$

(19) $3\int_{\pi/2}^{\pi}Sinx.dx=$ (A) 1 (B) 2 (C) 3 (D) 4

(20) Solution of differential equation $(e^x+e^{-x})\frac{dy}{dx}=e^x-e^{-x}$ is $y=$
(A) $\log_a(e^x+e^{-x})+c$ (B) $\log_e(e^x+e^{-x})+c$ (C) $\log_a(e^x-e^{-x})+c$ (D) $\log_e(e^x-e^{-x})+c$

2018 (A) Roll No: Multan Board-2018

INTERMEDIATE PART-II (12^{th} CLASS)

MATHEMATICS PAPER-II TIME ALLOWED: 2.30 Hours

GROUP-I **SUBJECTIVE** MAXIMUM MARKS: 80

NOTE: - Write same question number and its part number on answer book, as given in the question paper.

SECTION-I

2. Attempt any eight parts. **$8 \times 2 = 16$**

(i) Define explicit function and give an example.

(ii) Find $\dfrac{f(a+h)-f(a)}{h}$ and simplify where $f(x) = \cos x$

(iii) Prove that $\lim\limits_{n\to\infty}\left(1+\dfrac{1}{n}\right)^n = e$

(iv) Find by definition, the derivative of $2-\sqrt{x}$ w.r.to 'x'.

(v) Find $\dfrac{dy}{dx}$ if $y = \dfrac{(\sqrt{x}+1)(x^{3/2}-1)}{x^{1/2}-1}$, $x \neq 1$

(vi) Differentiate $\left(\sqrt{x}-\dfrac{1}{\sqrt{x}}\right)^2$ w.r.to 'x'.

(vii) Find $\dfrac{dy}{dx}$ if $y^2 - xy + 4 - x^2 = 0$

(viii) Differentiate $\tan^3\theta \sec\theta$ w.r.to 'θ'.

(ix) Find $\dfrac{dy}{dx}$ if $x = y\sin y$

(x) Differentiate $(\ell n x)^x$ w.r.to 'x'.

(xi) Find $f'(x)$ if $f(x) = x^3 e^{1/x}$, $x \neq 0$

(xii) Find y_2 if $x^2 + y^2 = a^2$

3. Attempt any eight parts. **$8 \times 2 = 16$**

(i) Find δy and dy if $y = \sqrt{x}$ when x changes from 4 to 4.41.

(ii) Evaluate $\displaystyle\int \frac{\sin x + \cos^3 x}{Cos^2 x \sin x}\,dx$

(iii) Evaluate $\displaystyle\int \frac{1}{x\ell n x}\,dx$

(iv) Evaluate $\displaystyle\int x\sin x\,dx$

(v) Evaluate $\displaystyle\int e^{-x}(\cos x - \sin x)\,dx$

(vi) Evaluate $\displaystyle\int \frac{5x+8}{(x+3)(2x-1)}\,dx$

(vii) State the fundamental theorem of calculus.

(viii) Evaluate $\displaystyle\int_1^2 \frac{xdx}{x^2+2}$

(ix) Find the area bounded by the curve $y = 4 - x^2$ and the x-axis.

(x) Solve $\sec^2 x \tan y\,dx + \sec^2 y \tan x\,dy = 0$

(xi) Graph the inequality $3x + 7y \geq 21$

(xii) State the Linear Programming Theorem.

4. Attempt any nine parts. $9 \times 2 = 18$

(i) Find "h" such that $A(-1, h)$, $B(3, 2)$ and $C(7, 3)$ are collinear.

(ii) Find an equation of the line passing through $(-5, -3)$ and $(9, -1)$.

(iii) Find the area of the region bounded by the triangle with vertices $A(1, 4)$, $B(2, -3)$ and $C(3, -10)$

(iv) Find value of "p" such that lines $2x - 3y - 1 = 0$, $3x - y - 5 = 0$ and $3x + py + 8 = 0$ meet at a point.

(v) Find the lines represented by $6x^2 - 19xy + 15y^2 = 0$

(vi) Find the focus and vertex of the parabola $x^2 - 4x - 8y + 4 = 0$

(vii) Find equation of parabola with focus $(2, 5)$ and directrix $y = 1$

(viii) Find foci and vertices of the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$

(ix) Find an equation of the ellipse with foci $\left(\pm 3\sqrt{3}, 0\right)$ and vertices $(\pm 6, 0)$.

(x) Find the direction cosines of vector $\underline{v} = \underline{i} - \underline{j} - \underline{k}$

(xi) Find real number "α" so that the vectors $\underline{u} = \alpha\underline{i} + 2\alpha\underline{j} - \underline{k}$ and $\underline{v} = \underline{i} + \alpha\underline{j} + 3\underline{k}$ are perpendicular.

(xii) Find the area of the triangle with vertices $A(1, -1, 1)$, $B(2, 1, -1)$ and $C(-1, 1, 2)$.

(xiii) Prove that the vectors $\underline{i} - 2\underline{j} + 3\underline{k}$, $-2\underline{i} + 3\underline{j} - 4\underline{k}$ and $\underline{i} - 3\underline{j} + 5\underline{k}$ are coplaner.

SECTION-II

NOTE: - Attempt any three questions. $3 \times 10 = 30$

5.(a) If θ is measured in Radian, then prove that $\lim_{\theta \to 0} \frac{\sin\theta}{\theta} = 1$

(b) Show that $2^{x+h} = 2^x\left[1 + (\ell n 2)h + \frac{(\ell n 2)^2}{\underline{|2}}h^2 + \frac{(\ell n 2)^3}{\underline{|3}}h^3 + ----\right]$

6.(a) Evaluate the indefinite integral $\int \frac{x^2 + 3x - 34}{x^2 + 2x - 15}\,dx$

(b) Find a joint equation of the lines through the origin and perpendicular to the lines $ax^2 + 2hxy + by^2 = 0$

7. (a) Evaluate the integral $\int_0^1 \frac{3x}{\sqrt{4 - 3x}}\,dx$

(b) Minimize $z = 2x + y$ subject to the constraints $x + y \ge 3$; $7x + 5y \le 35$; $x \ge 0$; $y \ge 0$

8. (a) Find equations of tangents to the circle $x^2 + y^2 = 2$ which are perpendicular to the line $3x + 2y = 6$

(b) Prove that for any triangle ΔABC $\quad a^2 = b^2 + c^2 - 2bc\ Cos\,A$

9.(a) Discuss and sketch the graph of the equation $25x^2 - 16y^2 = 400$

(b) Find volume of the tetrahedron with vertices (2, 1, 8), (3, 2, 9), (2, 1, 4) and (3, 3, 10).

Paper Code Number: 4196	2018 (A) INTERMEDIATE PART-II (12th CLASS)	Roll No: Multan Board-2018

MATHEMATICS PAPER-II TIME ALLOWED: 30 Minutes
GROUP-II **OBJECTIVE** MAXIMUM MARKS: 20

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that bubble in front of that question number. Use marker or pen to fill the bubbles. Cutting or filling two or more bubbles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank. No credit will be awarded in case BUBBLES are not filled. Do not solve questions on this sheet of OBJECTIVE PAPER.

Q.No.1

(1) Distance between points (7, 6) and (3, 3) is:- (A) 3 (B) 5 (C) 6 (D) 7

(2) If two lines with slopes m_1, m_2 are parallel then:-
(A) $m_1 = m_2$ (B) $m_1 = -m_2$ (C) $\frac{m_1}{m_2} = 2$ (D) $\frac{m_1}{m_2} = -1$

(3) Slope of line $5x + 7y = 35$ is:- (A) $\frac{5}{7}$ (B) $\frac{7}{5}$ (C) 35 (D) $\frac{-5}{7}$

(4) Equation of line with slope -2, y – intercept 3 is:-
(A) $x - 2y = 3$ (B) $3x + 2y = 2$ (C) $2x + y = 3$ (D) $x + 3y = 2$

(5) _____ point satisfy $x - y < 2$.
(A) $(3, 1)$ (B) $(-1, 1)$ (C) $(1, -1)$ (D) $(0, -2)$

(6) Centre of circle $x^2 + y^2 - 6x + 4y + 13 = 0$ is:-
(A) $(3, -2)$ (B) $(-3, -2)$ (C) $(-3, 2)$ (D) $(3, 2)$

(7) Equation of directrix of $y^2 = -4ax$ is:-
(A) $y = -a$ (B) $y = a$ (C) $x = -a$ (D) $x = a$

(8) Focus of $\frac{x^2}{25} + \frac{y^2}{16} = 1$ is:- (A) $(\pm 4, 0)$ (B) $(\pm 5, 0)$ (C) $(0, \pm 3)$ (D) $(\pm 3, 0)$

(9) $2\underline{i} \times 2\underline{j} \cdot \underline{k} =$ (A) 2 (B) 4 (C) 0 (D) 6

(10) For a vector $\underline{v} = 2\underline{i} + 3\underline{j} - 6\underline{k}$, $Cos\beta =$ (A) $\frac{-6}{7}$ (B) $\frac{2}{7}$ (C) $\frac{3}{7}$ (D) $\frac{-3}{7}$

(11) If $g(x) = \frac{3}{x-1}$, then $gog(4) =$ (A) 3 (B) 1 (C) Undefined (D) 0

(12) $\lim_{\theta \to 0} \frac{Sin7\theta}{\theta} =$ (A) 0 (B) Undefined (C) 1 (D) 7

(13) $\frac{d}{dx}\left(Cos^{-1} 3x\right) =$ (A) $\frac{3}{\sqrt{1-9x^2}}$ (B) $\frac{-3}{\sqrt{1-9x^2}}$ (C) $\frac{1}{\sqrt{1-9x^2}}$ (D) $\frac{-1}{\sqrt{1-9x^2}}$

(14) $\frac{d}{dx} e^{5x-2} =$ (A) $5e^{5x-2}$ (B) $2e^{5x-2}$ (C) e^{5x-3} (D) $5e^{5x-3}$

(15) $\frac{d^2}{dx^2}\left(Cos h3x\right) =$ (A) $3\cos h3x$ (B) $3\sin h3x$ (C) $-9\cos h3x$ (D) $9\cos h3x$

(16) $\frac{d}{dx}\left(\cot^{-1}\frac{x}{a}\right) =$ (A) $\frac{a}{a^2 + x^2}$ (B) $\frac{a^2}{a^2 + x^2}$ (C) $\frac{-a}{a^2 + x^2}$ (D) $\frac{-1}{a^2 + x^2}$

(17) $\int \frac{1}{ax + b} dx =$
(A) $\ell n(ax + b) + c$ (B) $\frac{1}{a}\ell n(ax + b) + c$ (C) $\frac{1}{b}\ell n(ax + b) + c$ (D) $a\ell n(ax + b) + c$

(18) $\int e^x\left(\frac{1}{x} + \ell nx\right) dx =$ (A) $e^x \ell nx + c$ (B) $\frac{1}{x}e^x + c$ (C) $e^x + c$ (D) $\ell nx + c$

(19) $\int_0^\pi Cos\,x\,dx =$ (A) π (B) 2 (C) 1 (D) 0

(20) $\int_2^4 \frac{1}{x} dx =$ (A) $\ell n4$ (B) 4 (C) $\ell n2$ (D) 2

2018 (A) Roll No: ____

INTERMEDIATE PART-II (12th CLASS)

MATHEMATICS PAPER-II TIME ALLOWED: 2.30 Hours

GROUP-II **SUBJECTIVE** MAXIMUM MARKS: 80

NOTE: - Write same question number and its part number on answer book, as given in the question paper.

SECTION-I

2. Attempt any eight parts. **$8 \times 2 = 16$**

(i) Evaluate $\lim\limits_{x \to 0} \dfrac{\sqrt{x+a} - \sqrt{a}}{x}$

(ii) Express $\lim\limits_{n \to \infty}\left(1 + \dfrac{3}{n}\right)^{2n}$ in terms of number "e".

(iii) Give three conditions for a function $f(x)$ to be continuous at a number 'C'.

(iv) Write any two different notations for the derivative of a function $f(x)$.

(v) Find derivative of $\dfrac{1}{(az-b)^7}$ w.r.t. z using power rule.

(vi) Differentiate $\dfrac{x^2+1}{x^2-3}$ w.r.t. x

(vii) If $y = \sqrt{x} - \dfrac{1}{\sqrt{x}}$. Show that $2x\dfrac{dy}{dx} + y = 2\sqrt{x}$

(viii) Find the first derivative of implicit function $y^2 + x^2 - 4x = 5$

(ix) Differentiate x and y w.r.t. 't' if $x = \dfrac{1-t^2}{1+t^2}$, $y = \dfrac{2t}{1+t^2}$

(x) Differentiate $Sin^2 x$ w.r.t. $Cos^4 x$

(xi) If $x = aCos^3\theta$, $y = bSin^3\theta$, then show that $a\dfrac{dy}{dx} + b\tan\theta = 0$

(xii) Find $\dfrac{dy}{dx}$ if $y = \ell n(\tanh x)$

3. Attempt any eight parts. **$8 \times 2 = 16$**

(i) Find δy and dy when $y = x^2 + 2x$ when x changes from 2 to 1.8.

(ii) Evaluate $\int \dfrac{e^{2x} + e^x}{e^x}\,dx$

(iii) Evaluate $\int \dfrac{ax+b}{ax^2+2bx+c}\,dx$

(iv) Evaluate $\int \dfrac{x}{\sqrt{4+x^2}}\,dx$

(v) Evaluate $\int \dfrac{1}{x\,\ell n x}\,dx$

(vi) Evaluate $\int x\cos x\,dx$

(vii) Evaluate $\int_1^2 \ell n x\,dx$

(viii) Evaluate $\int e^x(Cosx + Sinx)\,dx$

(ix) Evaluate $\int Tan^{-1}x\,dx$

(x) Find the area bounded by the curve $y = x^3 + 3x^2$ and the x-axis.

(xi) Define feasible solution set.

(xii) Graph the inequality $x + 2y < 6$

4. Attempt any nine parts. $9 \times 2 = 18$

(i) Prove that $A(3,1)$, $B(-2,-3)$ and $C(2,2)$ are vertices of an isosceles triangle.

(ii) If origin is translated to $O'(-3,2)$ find new coordinates of $P(-2,6)$.

(iii) Find the distance of $P(6,-1)$ from the line $6x - 4y + 9 = 0$

(iv) Find equation of line whose slope is -4 and $x-$intercept is -9.

(v) Find equation of each line represented by $20x^2 + 17xy - 24y^2 = 0$

(vi) Find focus, directrix of parabola $y = 6x^2 - 1$

(vii) Find equation of parabola if its focus is (2, 5), directrix $y = 1$

(viii) Find centre and vertices of ellipse $\frac{(2x-1)^2}{16} + \frac{(y+2)^2}{16} = 1$

(ix) Find equation of ellipse with centre (0, 0) focus (0, -3), vertex (0, 4)

(x) Find direction cosine of $\overline{PQ}$ if $P(2,1,5)$, $Q(1,3,1)$

(xi) Find unit vector in the direction of the vector $\underline{V} = 2\underline{i} + 6\underline{j}$.

(xii) A force $\underline{F} = 4\underline{i} - 3\underline{k}$, passes through the point $A(2,-2,5)$. Find the moment of $\underline{F}$ about point $B(1,-3,1)$

(xiii) Find 'α', so that $|\alpha\underline{i} + (\alpha+1)\underline{j} + 2\underline{k}| = 3$

SECTION-II

NOTE: - Attempt any three questions. $3 \times 10 = 30$

5.(a) $f(x) = \begin{cases} \dfrac{\sqrt{2x+5} - \sqrt{x+7}}{x-2} & if \quad x \neq 2 \\ k & if \quad x = 2 \end{cases}$

Find the value of k so that the function is continuous at $x = 2$.

(b) If $y = e^{ax}\sin bx$, show that $\frac{d^2y}{dx^2} - 2a\frac{dy}{dx} + (a^2+b^2)y = 0$

6.(a) Evaluate $\int \sqrt{a^2 + x^2}\, dx$

(b) The vertices of a triangle are $A(-2,3)$, $B(-4,1)$ and $C(3,5)$. Find coordinates of the centroid of the triangle.

7. (a) Find the area bounded by the curve $y = x^3 - 4x$ and the $x-$axis.

(b) Maximize $z = 2x + 3y$ subject to the constraints
$3x + 4y \le 12$; $2x + y \le 4$; $4x - y \le 4$; $x \ge 0$; $y \ge 0$

8. (a) Write an equation of the circle that passes through the given points. $A(4,5)$, $B(-4,-3)$, $C(8,-3)$

(b) Prove that $Cos(\alpha + \beta) = Cos\,\alpha\, Cos\beta - Sin\alpha\, Sin\beta$

9.(a) Find the center, Foci, Eccentricity vertices and equation of directrices of $x^2 - y^2 = 9$

(b) Find the volume of tetrahedron whose vertices are $A(2,1,8)$, $B(3,2,9)$, $C(2,1,4)$ and $D(3,3,0)$